

What is claimed is:

1. A laminate superconducting article comprising:
  - a. a substrate;
  - b. a biaxially textured buffer system on said substrate, said biaxially textured buffer system comprising at least an Ir buffer layer; and
  - c. an epitaxial layer of a superconductor on said biaxially textured buffer system.
2. A laminate superconducting article in accordance with claim 1 wherein at least a portion of said substrate comprises at least one of the group consisting of stainless steel, Cu, Ni, Fe, Al, Ag, and alloys of any of the foregoing.
3. A laminate superconducting article in accordance with claim 1 wherein at least a portion of said substrate comprises at least one of the group consisting of Ni-W, Ni-Cr, Ni-Cr-W, Ni-Cr-V, Ni-V, and Ni-Mn.
4. A laminate superconducting article in accordance with claim 1 wherein at least a portion of said substrate comprises at least one of the group consisting of MgO, SrTiO<sub>3</sub>, and REAlO<sub>3</sub>, where RE comprises at least one rare-earth element.
5. A laminate superconducting article in accordance with claim 1 wherein at least a portion of said substrate is characterized by at least one of the group of characteristics consisting of single crystal, biaxially textured, and untextured.
6. A laminate superconducting article in accordance with claim 1 wherein said Ir buffer layer is on said substrate.
7. A laminate superconducting article in accordance with claim 1 wherein said Ir buffer layer is on an intermediate layer, said intermediate layer being on said substrate.
8. A laminate superconducting article in accordance with claim 1 wherein said intermediate layer comprises TiN.

9. A laminate superconducting article in accordance with claim 1 wherein said buffer system further comprises the alloy  $\text{Ir}_{1-x}\text{M}_x$  wherein M comprises at least one element selected from the group consisting of Ta, Ti, Cu, Pt, Pd, Ru, Rh, Os, Au, and Ag.
10. A laminate superconducting article in accordance with claim 1 wherein said buffer system further comprises:
  - a. a biaxially textured Ir buffer layer; and
  - b. at least one epitaxial buffer layer on said Ir buffer layer.
11. A laminate superconducting article in accordance with claim 10 wherein said Ir buffer layer further comprises the alloy  $\text{Ir}_{1-x}\text{M}_x$  wherein M comprises at least one element selected from the group consisting of Ta, Ti, Cu, Pt, Pd, Ru, Rh, Os, Au, and Ag.
12. A laminate superconducting article in accordance with claim 10 wherein said Ir buffer layer is on said substrate.
13. A laminate superconducting article in accordance with claim 10 wherein said Ir buffer layer is on an intermediate layer, said intermediate layer being on said substrate.
14. A laminate superconducting article in accordance with claim 13 wherein said intermediate layer comprises TiN.
15. A laminate superconducting article in accordance with claim 10 wherein said buffer layer further comprises at least one buffer selected from the group consisting of TiN,  $\text{CeO}_2$ ,  $\text{Y}_2\text{O}_3$ ,  $\text{SrTiO}_3$ ,  $\text{BaZrO}_3$ ,  $\text{BaSnO}_3$ ,  $\text{BaCeO}_3$ , YSZ,  $(\text{RE}_{1-x}\text{Sr}_x)\text{MnO}_3$ ,  $\text{REMnO}_3$ ,  $\text{RE}_2\text{O}_3$ ,  $\text{REAlO}_3$ ,  $\text{RE}_2\text{Zr}_2\text{O}_7$ ,  $\text{RE}_3\text{NbO}_7$ , RESMO, and REMO where RE comprises at least one rare-earth element.
16. A laminate superconducting article in accordance with claim 10 wherein said buffer layer further comprises at least one buffer selected from the group consisting of  $\text{LaNiO}_3$ ,  $\text{La}_{0.7}\text{Ca}_{0.3}\text{MnO}_3$ ,  $\text{LaCoO}_3$ ,  $\text{La}_{0.5}\text{Sr}_{0.5}\text{TiO}_3$ ,  $\text{SrRuO}_3$ , and  $\text{La}_2\text{CuO}_4$ .

17. A laminate superconducting article in accordance with claim 1 wherein said buffer system further comprises:
  - a. a biaxially textured Ir buffer layer;
  - b. an epitaxial first buffer layer on said Ir buffer layer; and
  - c. an epitaxial second buffer layer on said first buffer layer.
18. A laminate superconducting article in accordance with claim 17 wherein said Ir buffer layer further comprises the alloy  $\text{Ir}_{1-x}\text{M}_x$  wherein M comprises at least one element selected from the group consisting of Ta, Ti, Cu, Pt, Pd, Ru, Rh, Os, Au, and Ag.
19. A laminate superconducting article in accordance with claim 17 wherein said Ir buffer layer is on said substrate.
20. A laminate superconducting article in accordance with claim 17 wherein said Ir buffer layer is on an intermediate layer, said intermediate layer being on said substrate.
21. A laminate superconducting article in accordance with claim 20 wherein said intermediate layer comprises TiN.
22. A laminate superconducting article in accordance with claim 17 wherein said first buffer layer further comprises at least one buffer selected from the group consisting of TiN,  $\text{CeO}_2$ ,  $\text{Y}_2\text{O}_3$ ,  $\text{SrTiO}_3$ ,  $\text{BaZrO}_3$ ,  $\text{BaSnO}_3$ ,  $\text{BaCeO}_3$ , YSZ,  $(\text{RE}_{1-x}\text{Sr}_x)\text{MnO}_3$ ,  $\text{REMnO}_3$ ,  $\text{RE}_2\text{O}_3$ ,  $\text{REAlO}_3$ ,  $\text{RE}_2\text{Zr}_2\text{O}_7$ ,  $\text{RE}_3\text{NbO}_7$ , RESMO, and REMO where RE comprises at least one rare-earth element.
23. A laminate superconducting article in accordance with claim 17 wherein said first buffer layer further comprises at least one buffer selected from the group consisting of  $\text{LaNiO}_3$ ,  $\text{La}_{0.7}\text{Ca}_{0.3}\text{MnO}_3$ ,  $\text{LaCoO}_3$ ,  $\text{La}_{0.5}\text{Sr}_{0.5}\text{TiO}_3$ ,  $\text{SrRuO}_3$ , and  $\text{La}_2\text{CuO}_4$ .
24. A laminate superconducting article in accordance with claim 17 wherein said second buffer layer further comprises  $\text{CeO}_2$ ,

25. A laminate superconducting article in accordance with claim 1 wherein said buffer system further comprises:
  - a. a biaxially textured Ir buffer layer;
  - b. an epitaxial first buffer layer on said Ir buffer layer;
  - c. an epitaxial second buffer layer on said first buffer layer;
  - d. an epitaxial third buffer layer on said second buffer layer; and
  - e. an epitaxial layer of a superconductor on said third buffer layer.
26. A laminate superconducting article in accordance with claim 25 wherein said Ir buffer layer further comprises the alloy  $\text{Ir}_{1-x}\text{M}_x$  wherein M comprises at least one element selected from the group consisting of Ta, Ti, Cu, Pt, Pd, Ru, Rh, Os, Au, and Ag.
27. A laminate superconducting article in accordance with claim 25 wherein said Ir buffer layer is on said substrate.
28. A laminate superconducting article in accordance with claim 25 wherein said Ir buffer layer is on an intermediate layer, said intermediate layer being on said substrate.
29. A laminate superconducting article in accordance with claim 28 wherein said intermediate layer comprises TiN.
30. A laminate superconducting article in accordance with claim 25 wherein said first buffer layer further comprises at least one buffer selected from the group consisting of TiN,  $\text{CeO}_2$ ,  $\text{Y}_2\text{O}_3$ ,  $\text{SrTiO}_3$ ,  $\text{BaZrO}_3$ ,  $\text{BaSnO}_3$ ,  $\text{BaCeO}_3$ , YSZ,  $(\text{RE}_{1-x}\text{Sr}_x)\text{MnO}_3$ ,  $\text{REMnO}_3$ ,  $\text{RE}_2\text{O}_3$ ,  $\text{REAlO}_3$ ,  $\text{RE}_2\text{Zr}_2\text{O}_7$ ,  $\text{RE}_3\text{NbO}_7$ , RESMO, and REMO where RE comprises at least one rare-earth element.
31. A laminate superconducting article in accordance with claim 25 wherein said first buffer layer further comprises at least one buffer selected from the group consisting of  $\text{LaNiO}_3$ ,  $\text{La}_{0.7}\text{Ca}_{0.3}\text{MnO}_3$ ,  $\text{LaCoO}_3$ ,  $\text{La}_{0.5}\text{Sr}_{0.5}\text{TiO}_3$ ,  $\text{SrRuO}_3$ , and  $\text{La}_2\text{CuO}_4$ .
32. A laminate superconducting article in accordance with claim 25 wherein said second buffer layer further comprises YSZ.

33. A laminate superconducting article in accordance with claim 25 wherein said third buffer layer further comprises  $\text{CeO}_2$ .
34. A laminate superconducting article in accordance with any one of claims 1-33, inclusive, wherein said superconductor comprises REBCO where RE comprises at least one rare-earth element.
35. A laminate superconducting article comprising:
  - a. a substrate comprising biaxially textured Ir;
  - b. a biaxially textured superconductor on said Ir substrate.
36. A laminate superconducting article in accordance with claim 35 wherein said Ir substrate further comprises the alloy  $\text{Ir}_{1-x}\text{M}_x$  wherein M comprises at least one element selected from the group consisting of Ta, Ti, Cu, Pt, Pd, Ru, Rh, Os, Au, and Ag.
37. A laminate superconducting article in accordance with either of claims 34 or 35 wherein said superconductor comprises REBCO where RE comprises at least one rare-earth element.
38. A laminate superconducting article comprising:
  - a. a substrate comprising biaxially textured Ir;
  - b. a biaxially textured buffer system on said substrate; and
  - c. an epitaxial layer of a superconductor on said biaxially textured buffer system.
39. A laminate superconducting article in accordance with claim 38 wherein said biaxially textured Ir substrate further comprises the alloy  $\text{Ir}_{1-x}\text{M}_x$  wherein M comprises at least one element selected from the group consisting of Ta, Ti, Cu, Pt, Pd, Ru, Rh, Os, Au, and Ag.
40. A laminate superconducting article in accordance with claim 38 wherein said biaxially textured buffer system further comprises at least one buffer selected from the group consisting of TiN,  $\text{CeO}_2$ ,  $\text{Y}_2\text{O}_3$ ,  $\text{SrTiO}_3$ ,  $\text{BaZrO}_3$ ,  $\text{BaSnO}_3$ ,  $\text{BaCeO}_3$ , YSZ,  $(\text{RE}_{1-x}\text{Sr}_x)\text{MnO}_3$ ,

REMnO<sub>3</sub>, RE<sub>2</sub>O<sub>3</sub>, REAlO<sub>3</sub>, RE<sub>2</sub>Zr<sub>2</sub>O<sub>7</sub>, RE<sub>3</sub>NbO<sub>7</sub>, RESMO, and REMO where RE comprises at least one rare-earth element.

41. A laminate superconducting article in accordance with claim 38 wherein said biaxially textured buffer system further comprises at least one buffer selected from the group consisting of LaNiO<sub>3</sub>, La<sub>0.7</sub>Ca<sub>0.3</sub>MnO<sub>3</sub>, LaCoO<sub>3</sub>, La<sub>0.5</sub>Sr<sub>0.5</sub>TiO<sub>3</sub>, SrRuO<sub>3</sub>, and La<sub>2</sub>CuO<sub>4</sub>.
42. A laminate superconducting article in accordance with claim 38 wherein said buffer system further comprises:
  - a. a biaxially textured first buffer layer on said biaxially textured Ir substrate; and
  - b. an epitaxial second buffer layer on said first buffer layer.
43. A laminate superconducting article in accordance with claim 42 wherein said first buffer layer further comprises at least one buffer selected from the group consisting of TiN, CeO<sub>2</sub>, Y<sub>2</sub>O<sub>3</sub>, SrTiO<sub>3</sub>, BaZrO<sub>3</sub>, BaSnO<sub>3</sub>, BaCeO<sub>3</sub>, YSZ, (RE<sub>1-x</sub>Sr<sub>x</sub>)MnO<sub>3</sub>, REMnO<sub>3</sub>, RE<sub>2</sub>O<sub>3</sub>, REAlO<sub>3</sub>, RE<sub>2</sub>Zr<sub>2</sub>O<sub>7</sub>, RE<sub>3</sub>NbO<sub>7</sub>, RESMO, and REMO where RE comprises at least one rare-earth element.
44. A laminate superconducting article in accordance with claim 42 wherein said first buffer layer further comprises at least one buffer selected from the group consisting of LaNiO<sub>3</sub>, La<sub>0.7</sub>Ca<sub>0.3</sub>MnO<sub>3</sub>, LaCoO<sub>3</sub>, La<sub>0.5</sub>Sr<sub>0.5</sub>TiO<sub>3</sub>, SrRuO<sub>3</sub>, and La<sub>2</sub>CuO<sub>4</sub>.
45. A laminate superconducting article in accordance with claim 42 wherein said second buffer layer further comprises CeO<sub>2</sub>,
46. A laminate superconducting article in accordance with claim 38 wherein said buffer system further comprises:
  - a. a biaxially textured first buffer layer on said biaxially textured Ir substrate;
  - b. an epitaxial second buffer layer on said first buffer layer;
  - c. an epitaxial third buffer layer on said second buffer layer; and
  - d. an epitaxial layer of a superconductor on said third buffer layer.

47. A laminate superconducting article in accordance with claim 46 wherein said first buffer layer further comprises at least one buffer selected from the group consisting of TiN, CeO<sub>2</sub>, Y<sub>2</sub>O<sub>3</sub>, SrTiO<sub>3</sub>, BaZrO<sub>3</sub>, BaSnO<sub>3</sub>, BaCeO<sub>3</sub>, YSZ, (RE<sub>1-x</sub>Sr<sub>x</sub>)MnO<sub>3</sub>, REMnO<sub>3</sub>, RE<sub>2</sub>O<sub>3</sub>, REAlO<sub>3</sub>, RE<sub>2</sub>Zr<sub>2</sub>O<sub>7</sub>, RE<sub>3</sub>NbO<sub>7</sub>, RESMO, and REMO where RE comprises at least one rare-earth element.
48. A laminate superconducting article in accordance with claim 46 wherein said first buffer layer further comprises at least one buffer selected from the group consisting of LaNiO<sub>3</sub>, La<sub>0.7</sub>Ca<sub>0.3</sub>MnO<sub>3</sub>, LaCoO<sub>3</sub>, La<sub>0.5</sub>Sr<sub>0.5</sub>TiO<sub>3</sub>, SrRuO<sub>3</sub>, and La<sub>2</sub>CuO<sub>4</sub>.
49. A laminate superconducting article in accordance with claim 46 wherein said second buffer layer further comprises YSZ.
50. A laminate superconducting article in accordance with claim 46 wherein said third buffer layer further comprises CeO<sub>2</sub>.
51. A laminate superconducting article in accordance with any one of claims 38-50, inclusive, wherein said superconductor comprises REBCO where RE comprises at least one rare-earth element.